DOCUMENT RESUME

ED 208 935 PS 012 241

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TITLE Facilitating Children's Understanding of Questions Through Pictures: Implications for Social Class Language Differences.
PUB DATE Mar 81
NOTE 19p.; Paper presented at the Annual Meeting of the Eastern Educational Research Association (4th, Philadelphia, PA, March 12-14, 1981).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Age Differences; Child Language; Comparative Analysis; *Comprehension; Disadvantaged; Language Acquisition; *Language Processing; Language Research; *Performance Factors; Pictorial Stimuli; *Preschool Children; *Social Differences; *Verbal Ability
IDENTIFIERS Stimulus Complexity; *Wh Questions

ABSTRACT

Two levels of stimulus condition were used to determine whether or not the amount of salient information contained in the perceptual stimuli accompanying orally presented "wh-questions" (those including the concepts who, what, where, when, how and why) facilitates children's comprehension. Conditions varied in terms of the number of wh-questions that could be answered from pictorial stimuli: more than one (Multiple Option Stimulus Condition) or only one (Single Option Stimulus Condition). It was predicted that children's comprehension of wh-questions would be affected by the stimulus condition; specifically, it was hypothesized that fewer questions would be comprehended in the Multiple Option Stimulus Condition than in the Single Option Stimulus Condition and that differences would vary depending on the age of the child as well as on which wh-question word was the target. An additional hypothesis was investigated: socioeconomic status (SES) was expected to interact with stimulus condition, revealing greater SES differences in the Multiple Option than in the Single Option Stimulus Condition. Subjects were 120 white preschool children, 60 boys and 60 girls from low- and middle-SES homes. Thirty questions were constructed as stimuli, five for each of the six wh-question types. These were presented in the following syntactic frame: "Wh-word + is + the + noun + verb + ing?" In designing the pictures used, research on the effectiveness of pictorial stimuli was taken into account. Results are discussed. (Author/RH)

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Facilitating Children's Understanding of Questions Through Pictures: Implications for Social Class Language Differences

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Presented at the Eastern Educational Research Association Conference, Philadelphia, March 1981.

In a recent study by Gullo (in press), social class (SES) differences in preschool children's comprehension of wh-questions were examined. Results indicated that SES differences in the total number of questions correct varied dependent on the level of abstractness represented by the wh-word. For wh-words whose referents are concrete (what, who, where), SES differences were non-significant. For wh-words reflecting abstract concepts (why, when, how), SES differences were pronounced. Earlier studies of wh-question comprehension indicate that children's abilities to comprehend wh-words are developmentally sequenced with those wh-words representing concrete referents acquired first and those representing abstract referents last (Cairns & Hsu, 1978; Ervin-Tripp, 1970; Tyack & Ingram, 1977). Therefore, Gullo concluded that the SES differences found could be attributed to developmental differences between the SES groups reflective of differences in language use.

Research on SES differences in language use indidicates that middle SES children use language more than low SES children to analyze and to reason about past or present experiences, to project beyond present experiences to future events, and to talk about alternative courses and subsequent consequences (Bernstein, 1962; Tough, 1977; Blank, Rose, & Berlin, 1978).

Blank et al. (1978) studying SES differences in the language comprehension abilities of preschool children found that children's abilities to understand questions may vary depending upon the amount of salient information available to the child when the question was asked. It was posited that language varies across varied levels of discussion. The levels of discussion affect how close the language is to the perceptual stimuli that are being talked about. Blank calls this relationship between language and context "perceptual language distance." Blank and her associates found that middle SES children comprehended language across both concrete and abstract levels of discussion, whereas, low

SES children's comprehension of language was found to be restricted in the direction of concrete levels of discussion.

Blank et al.'s findings support the earlier findings of Rohwer and Matz (1975) who found that picture contexts facilitated the low SES children's overall performance with regard to comprehension of orally presented prose. At the same time, pictorialization had little effect on high SES children's performance in the same task.

The purpose of the present study was to determine whether or not the amount of salient information contained in the perceptual stimuli accompanying orally presented wh-questions will facilitate children's comprehension of these questions. Two levels of stimulus condition were used in this study. One stimulus condition presented the subjects with pictures designed such that more than one type of wh-question could be answered from the information presented (Multiple Option Stimulus Condition). A second stimulus condition presented the subjects with pictures designed such that only the stimulus question could be answered from the information in the picture (Single Option Stimulus Condition). It was predicted that children's comprehension of wh-questions would be affected by the stimulus condition such that fewer questions would be comprehended in the Multiple Option Stimulus Condition than in the Single Option Stimulus Condition and that differences would vary depending on the age of the child as well as which wh-word was the target word. Based on Rohwer and Matz's findings, one additional hypothesis was also tested: that SES would interact with the stimulus condition such that SES differences would be greater in the Multiple Option Stimulus Condition than in the Single Option Stimulus Condition.

Method

Subjects

The subjects were 120 white preschool children; 60 boys and 60 girls. The

children were from low and middle SES homes in a Midwest city. The low SES children were from four Head Start classes. Children were admitted into Head Start based upon family income, educational level of the parents as well as parents' occupation. It was therefore felt that admission into Head Start was a sufficient criterion for these children being placed in the low SES sample. The middle SES children were students in university and privately run preschools. The children were divided into three age groups with 20 subjects each: I 3;6 - 3;11, II 4;0 - 4;7, III 4;8 - 5;2. Each group contained 10 boys and 10 girls.

Materials

Questions. Thirty questions were constructed as stimuli, five for each of the six wh-word types (who, what, where, when, how, why). To control for the syntactic complexity of the questions, the same syntactic frame was used for all questions and the frame was the same as that used in other investigations (Tyack & Ingram, 1977):

Wh-word + is + the + noun + verb + ing?

A lack of realism reflected in pictures and the accompanying questions was a noted difficulty in an earlier study of wh-question comprehension (Tyack & Ingram, 1977). This was due to the strict control of the nouns and verbs used in the questions. In order to assure that comprehension of the questions was not a function of whether or not the questions and accompanying picture depicted a life-like situation, a greater variety of nouns and verbs was used in the present study. The nouns and verbs were selected from preprimer and primer word lists (Dolch, 1941; Stone, 1950) and pilot tested in order to determine whether all of the words chosen were equally comprehended. This would indicate that the variance in answers to the questions would not be a function of the difficulty level of the particular nouns and verbs in the questions. Results of the pilot test indicated that all the verbs and nouns were comprehended equally, with all

the words being identified by all the children. It is therefore felt that comprehension of a question in this study was not a function of the difficulty level of the specific verb or noun used in the question, but of the differences in wh-words.

Table 1 presents the actual questions used in this study.

Insert Table 1 about here

Pictures. In designing the pictorial stimuli, the researcher had a choice of several modes of presentation. The present study took into account the research on the effectiveness of pictorial stimuli (Cobun, 1961, Elkind, Vandoornick & Schwarz, 1967; Hinz, 1967; Meyer, 1978; Ryan & Schwartz, 1956; and Spaulding, 1955) in designing the pictures such that:

1. Mode of presentation of pictorial stimuli was black and white line drawings;
2. The objects and actions represented were the central focus of the drawings. In past studies of wh-question comprehension, pictures were used which represented possible answers to many wh-questions (Tyack & Ingram, 1977). Thus, some of the answers in the Tyack and Intram study may have been found in the foreground of the picture while other answers were in the background of the picture. Elkind et al. (1967) found that children tend to focus on the figure to the detriment of the ground and base recognition of the pictorial arrays on the basis of the central figure rather than utilize the entire array. Therefore, failure or success in answering wh-questions in the earlier study may have been a function of where the answer was located in the picture; and

3. The information level of the pictorial stimuli was held constant across all stimulus pictures. The information level of the pictorial unit was described by Hinz (1967) as varying degrees of added shading, natural environment, and interior detail.

Fifteen scenes were designed as stimuli according to the above criteria to show children, adults, and common objects in various situations. Each scene was designed to depict information appropriate for answering each of the wh-question pairs illustrated in Table 1. The 15 scenes in this set of pictures were used to constitute the pictures in the Multiple Option Stimulus Condition.

A second set of pictures was made identical to the first set except that the salient information required to answer one or the other wh-question in the pair was removed. This yielded an additional 30 pictures in the second set. The pictures in this set constituted the pictures in the Single Option Stimulus Condition.

An example of a set of pictures for a particular wh-word comparison is presented in Figures 1, 2, and 3.

Insert Figures 1, 2, and 3 about here

With the picture in Figure 1, both "What is jumping the wagon?" and "Who is jumping the wagon?" could be asked. In this situation the child must process the picture and make the decision as to the relationship between the elements in the picture ("who" or "what" is jumping). For the pictures in Figures 2 and 3, either "who" or "what" is jumping the wagon could be asked while both "who" and "what" is jumping the wagon can be asked with the picture in Figure 1. As can be seen, pictures (2) and (3) are identical to picture (1) other than the information to answer either question (2) or (3) is missing. In situations (2) and

(3) the child does not have to compare information from within the picture to make a decision regarding what is being represented by the wh-word in the question.

Procedure

Each subject was tested individually in two 20-minute sessions, with sessions defined by stimulus conditions.

In order to insure that in the Multiple Option Stimulus Condition the answers to the questions were not given by a process of elimination when the second question of the pair was asked, the pictures were duplicated such that the subjects viewed them twice, once for each question asked. The questions were arranged in random order.

To eliminate any effects regarding order of presentation of the questions, after each subject was completed, the order of presentation was changed such that the last question asked became the first question asked for the next subject. This process was repeated after each subject.

The order of presentation of Stimulus Condition was alternated across subjects. In this manner, one-half of the subjects in the study were presented with questions in the Multiple Option Stimulus Condition first, and one-half was presented with questions in the Single Option Stimulus Condition first.

During presentation, the questions were repeated upon request, as memory was not being tested. Responses to questions were scored categorically correct or not according to the following scoring procedures adopted from Tyack and Ingram (1977):

1. "who" questions require a human response;
2. "what" questions require an inanimate or non-human noun response;
3. "where" questions require a location response;
4. "why" questions require a causal response;
5. "how" questions require a response indicating manner; and

6. "when" questions require a response indicating time.

The response needed only to reflect the criteria of the stimulus wh-word to be scored as correct regardless of whether or not the response reflected the answer expected from the stimulus picture.

Results

To test the first hypothesis, 18 apriori planned contrasts were performed comparing the mean Total Number of Questions Correct (TQC) for each wh-word type between Single and Multiple Option Stimulus Conditions for each SES group. Mean TQC for each wh-word as well as significant Stimulus Condition differences for each SES group are presented in Tables 2 and 3.

Insert Tables 2 and 3 about here

The data supported the prediction that fewer wh-questions would be comprehended in the Multiple Option Stimulus Condition. As also was predicted, Stimulus Condition differences varied according to the age of the child and depended upon which wh-word was the target word.

In order to test for the SES by context interaction, a 2 x 2 analysis of variance (SES x Stimulus Condition) with repeated measures on Stimulus Condition was applied to the TQC. No significant interaction was found; thus, the prediction that overall SES differences would be diminished in the Single Option Stimulus Condition was not supported.

Discussion

The findings of the study support the prediction that all subjects would score higher TQC if the questions were presented in the Single Option Stimulus Condition than if the questions were presented in the Multiple Option Stimulus Condition. This finding is consistent with the research findings regarding children's response to various modes of pictorial presentation. Research has shown

that children's recognition rate for detail (Hinz, 1967) and children's speed of perception (Ryan & Schwartz, 1956) is facilitated when pictures are presented to them in a more simplified fashion.

Analysis of individual wh-words indicated that for some wh-words no significant Stimulus Condition differences were found. However, each mean difference for individual wh-words was always in the predicted direction.

No significant differences were found between Stimulus Conditions for "who" questions except for low SES, Age group I. One possible explanation for this lack of findings for "who" is that "who" is one of the earliest acquired wh-words according to developmental studies of wh-word acquisition. Most subjects in previous studies correctly comprehended "who" at about age three (Ervin-Tripp, 1970; Tyack & Ingram, 1977; Cairns & Hsu, 1978). The subjects in the present study were all over three years, six months; thus, all the subjects may be beyond the developmental level necessary for comprehending "who" as evidenced by the high TQC means in both context conditions.

As stated above, a significant Stimulus Condition difference was found for "who" for low SES Age group I. It is possible that these children do not yet comprehend all of the concepts related to the "who" construct. A potential explanation may be found in Clark's (1973) work on semantic features.

Clark states that when a child begins to use identifiable words, s/he does not know their full meanings and may use only a subset of its attributes or semantic features in identifying that word, confusion with similar concepts is likely. For example, a child who identifies the concept "dog" only by its semantic feature + (four legs), may also call a cat, a horse, or a cow a "dog." A similar confusion in semantic features between "who" and "what" concepts was also noted in this and other studies.

In an earlier wh-question comprehension study, Tyack and Ingram (1977) found that the youngest children often confused "who" and "what." For no other pair of wh-words was this consistent type of error made. The confusion was attributed to an error in the semantic feature + (animacy), which is a confusion between persons and objects. The removal of the extraneous information from the stimulus picture in the Single Option Stimulus Condition appears to increase the likelihood of correctly comprehending those words which subjects confuse with similar concepts sharing many semantic features. A confusion as such may be an indication that the child has not yet reached the level of total understanding of that wh-word construct. This assumption should be tested in future studies.

For Age group I in both middle and low SES there was a significant Stimulus Condition difference for "where." A potential explanation for this finding may be found in Tyack and Ingram (1977). Tyack and Ingram found that other than the correct response for "where," subjects responded to "where" questions with "what" answers. Conversely, when subjects were asked "who" questions, "where" answers were often given. Tyack and Ingram's data indicate that 19.7% of the answers to "where" questions were responses for "what" or "who" questions. Thus, it is suspected that subjects in this study did not have the full understanding of the "where" constructs and confused "where" with similar constructs in the Multiple Option Stimulus Condition.

No significant Stimulus differences were found for "when" and "how" for all children in the low SES group and for age groups II and III in the middle SES group. Most children in the low SES group had difficulty comprehending "when" and "how" as evidenced by low mean TQC in both Stimulus Conditions. On the basis of previous findings that "when" and "how" are acquired developmentally later (Cairns & Hsu, 1978; Ervin-Tripp, 1970; Tyack & Ingram, 1977), it is suspected that the comprehension of the "how" and "when" constructs are beyond the developmental capabili-

ties of the low SES group. Additional support may be found in the research on SES differences in language use. Tough (1977) found that middle SES children use language more than low SES children to talk about temporal relationships and to reason about perception. According to research on wh-question comprehension, the comprehension of "when" and "how" requires the ability to use abstract concepts related to time (when) and manner (how). Thus, it may be expected that low SES children will have difficulty comprehending the wh-words which reflect these abstract concepts, regardless of Stimulus Condition.

For middle SES, Age group I, there was a significant Stimulus Condition difference for "when" and "how." As stated earlier, this is probably indicative of the emerging state of understanding of these wh-word constructs for this age group. When the extraneous information was removed in the Single Option Stimulus Condition, correct answers to "when" and "how" questions appeared to be facilitated.

The findings for "why" also suggest that there may be developmental differences between SES groups for comprehending the "why" construct. Hood (1977) found, in studying the development of "why" questions, that the children she studied first expressed causal relations in their own spontaneous statements before they were able to respond to "why" questions appropriately. The non-expression of abstract causal relationships by low SES children is also an SES difference in language reported in the literature (Blank et al., 1978; Tough, 1977). From Hood's findings on the development of "why," along with the findings that low SES children are not proficient in using abstract causal relations in their spontaneous language, one could expect to find that low SES children will have difficulty with the comprehension of "why."

The only wh-word for which there was found a significant Stimulus Condition difference for all subjects was "what." It is suspected that the significant finding for "what" reflected subjects' confusing "what" and "who" when paired together

in the Multiple Option Stimulus Condition. In the Single Option Stimulus Condition, when the "who" information was removed and the subjects were asked the "what" question in that Stimulus Condition, the mean TQC was higher than for any other wh-word.

The prediction that SES would interact with the Stimulus Condition was not supported by the data. Although, within SES groups, comprehension scores significantly increased from the Multiple Option Stimulus Condition to the Single Option Stimulus Condition, they did so similarly for both SES groups of children. Thus, it would appear that SES differences remained significant in the Single Option Stimulus Condition.

As indicated above, it was discovered that some wh-words appeared to be beyond the developmental level of comprehension for the low SES subjects. Those wh-words were "when," "how," and "why." Thus, the low SES subjects had difficulty comprehending these wh-questions in both Stimulus Conditions. It was found that, except for Age group I, the middle SES subjects were beyond the developmental level necessary for comprehending "how," "why," and "when." The middle SES subjects, therefore, did equally as well with "how," "why," and "when" in both Stimulus Conditions.

This finding would imply that complexity of assertion may influence the effectiveness of pictorial support. It will be recalled that Rohwer and Matz (1973) found that picture contexts facilitated the performance of low SES children in comprehending prose while pictures had little or no effect on the performance of middle/high SES children. However, there was a trend in their data which indicated that there may be a possible interaction between pictorial support and the assertion complexity for high SES children. That is, on complex assertions, high SES children performed slightly better with pictorial support. Although Rowher's and Matz's findings were not significant, the data from the present study would support their contention.

In sum, the findings of this study suggest that pictorial support does facilitate preschool children's comprehension of wh-questions to some extent. Pictures are especially supportive if the child is at the developmental level where a specific linguistic construct is emerging but where the child is still in some confusion as to the construct's total meaning.

The finding most divergent from previous findings is that pictures do not seem to facilitate understanding for low SES children more than middle SES children. Again, this may be due to the apparent interaction between pictorialization and complexity of assertion. More research is clearly needed to resolve this issue.

Finally, the findings of this study suggest that the results of previous developmental acquisition studies of wh-question comprehension should be re-examined. Points of inquiry should be made relative to whether the order of acquisition of wh-words is different depending on the amount of information presented to the child when the question is asked.

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Figure 1. Example of a picture in the Multiple Option Stimulus Condition for a "who-what" question.

Figure 2. Example of a picture in the Single Option Stimulus Condition for a "who" question.

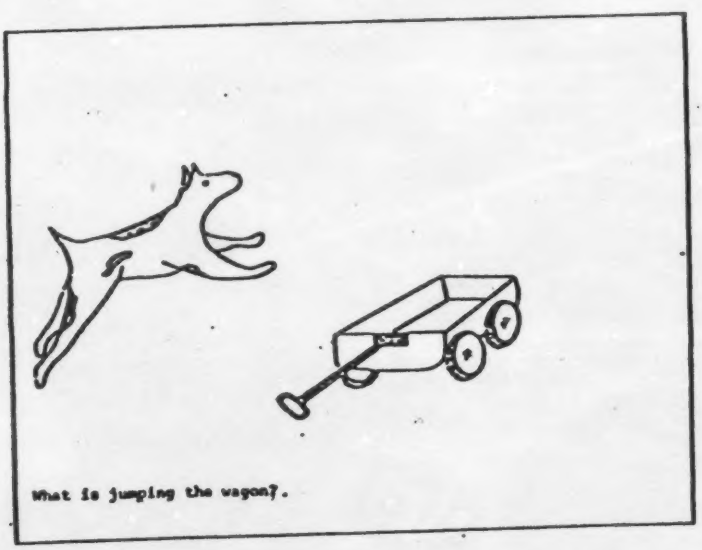

Figure 3. Example of a picture in the Single Option Stimulus Condition for a "what" question.

Table 1

Stimulus Questions

1.	Where	is the girl jumping?
2.	What	
3.	Where	is the boy helping?
4.	Who	
5.	Where	is the boy running?
6.	Why	
7.	Where	is the boy eating?
8.	How	
9.	Where	is the boy eating?
10.	When	
11.	What	is the dog jumping?
12.	Who	
13.	What	is the cat jumping?
14.	Why	
15.	What	is the boy eating?
16.	How	
17.	What	is the horse jumping?
18.	When	
19.	Who	is the girl helping?
20.	Why	
21.	Who	is the boy helping?
22.	How	
23.	Who	is the dog jumping?
24.	When	
25.	Why	is the girl helping?
26.	How	
27.	Why	is the boy jumping?
28.	When	
29.	How	is the boy eating?
30.	When	

Table 2

Mean Number of Questions Correct for Each Wh-Word Type for Subjects in the Low SES Group[a]

AGE GROUP	WHO	WHERE	WHEN	HOW	WHY	WHAT
3;6 - 3;11						
Context I[b]	3.55	1.90 *	.90	2.10	3.10	3.25 *
Context II[c]	4.50	3.00	.20	2.25	3.20	4.60
4;0 - 4;7						
Context I	4.25	2.65	.95	1.90	2.35 *	3.85 *
Context II	4.45	3.30	.85	2.40	3.20	4.90
4;8 - 5;2						
Context I	4.10	2.95 *	2.10	3.30	2.75 *	4.10 *
Context II	4.50	3.80	2.60	3.85	3.45	4.95

*p <.01, difference between means
[a]Five questions of each type were presented
[b]Single Option Stimulus Condition
[c]Multiple Option Stimulus Condition

Table 3

Mean Number of Questions Correct for Each Wh-Word Type for Subjects in the Middle SES Group[a]

AGE GROUP	WHO	WHERE	WHEN	HOW	WHY	WHAT
3;6 - 3;11						
Context I[b]	4.75	2.85 *	1.45 *	2.30 *	3.60 *	3.85 *
Context II[c]	4.75	3.85	2.30	3.20	4.40	4.95
4;0 - 4;7						
Context I	4.70	3.55	3.90	4.15	4.50	3.75 *
Context II	4.95	4.25	3.85	4.25	4.85	5.00
4;8 - 5;2						
Context I	4.90	4.35	4.20	3.65	4.70	4.00 *
Context II	5.00	4.90	4.45	4.40	4.75	5.00

*p <.01, difference between means
[a]Five questions of each type were presented
[b]Single Option Stimulus Condition
[c]Multiple Option Stimulus Condition